

REMARKS

The Office Action mailed February 9, 2005 (hereinafter "the Office Action") objected to the drawings, objected to the specification, objected to claims 3 and 4, and rejected all of the pending claims as unpatentably obvious under 35 U.S.C. 103(a) over Yonemoto U.S. Patent No. 5,808,677 or Yonemoto in view of Hoffman U.S. Patent No. 6,252,462. The specification has been amended to insert a new title and the claims have been amended, which amendments are believed to overcome the grounds for objection and rejections stated in the Office Action for the reasons set forth below. Reconsideration is respectfully requested.

Drawing Objections

Paragraph 1 of the Office Action objects to the drawings on the grounds that the drawings do not show every feature of the claimed invention because claim 1 (and the other claims) is directed to an "image sensor" and the Office Action asserts that the "image sensor" of claim 1 is shown in Fig. 1 as being "Prior Art". The Office Action has misconstrued and confused two terms in the specification and claims, namely, "image sensor" and "light sensor circuit". Fig. 1 illustrates the general arrangement of a conventional "light sensor circuit" which detects light and represents a single pixel. The claimed "image sensor" is comprised of numerous "light sensor circuits" arranged in a matrix, as clearly set forth in original independent claims 2 and 3. Two embodiments of the "image sensor" are shown in Figs. 8 and 11 in which there are sixteen "light sensor circuits"

illustrated and identified as D11 – D14, D21 – D24, D31 – D34 and D41 – D44. Thus the claimed “image sensor” is not illustrated by Fig. 1, as the Office Action asserts, but rather is illustrated by Figs. 8 and 11, for example, which are not labeled “Prior Art”. Thus, every feature of the invention specified in the claims is shown in the drawings and therefore the objection to the drawings in the Office Action should be withdrawn.

Objection to the Specification

The title of the invention was objected to as “not descriptive”. The title has been amended, as set forth above, but if the Examiner believes that a more descriptive title is required, counsel for Applicants respectfully requests that the Examiner offer a suggested title or identify what is not descriptive about the amended title.

Paragraph 3 of the Office Action objects to the disclosure as containing informalities. Specifically, the Office Action asserts that “Paragraph 0002 refers to Fig. 1 as illustrating a typical conventional image sensor” (emphasis added) which is clearly erroneous because that paragraph clearly states that Fig. 1 illustrates a “light sensor circuit for one pixel” not an “image sensor”. The Office Action confuses the terms “light sensor circuit” and “image sensor” which comprises a multiplicity of light sensor circuits. This is explained more thoroughly in the preceding section concerning the Drawing Objection but, briefly, Fig. 1 shows only a single “light sensor circuit” whereas Figs. 8 and 11 illustrate the claimed “image sensor” comprising a multiplicity (sixteen are shown) of light sensor circuits that are used in the invention. Paragraph 0011 as objected to in the Office Action clearly recites Fig. 1 is a circuit diagram of “a light sensor circuit for one pixel” which is used as a

component of the “image sensor according to the present invention” whereby this paragraph is accurate. Thus, a complete reading of the specification in conjunction with the drawings of the present application makes it clear that the claimed invention is to a “image sensor” that uses a multiplicity of “light sensor circuits” in a unique manner, not that those two elements are the same or interchangeable as the Office Action asserts. The objection to Paragraphs 0002 and 0011 should be withdrawn.

Objections to the Claims

Paragraph 4 of the Office Action objects to claims 3 and 4 as containing informalities. The suggestion in the Office Action for modifying claim 3, line 4 has been adopted whereby this objection is overcome. The Office Action objected to claim 4 as being unclear whether the first, second or third transistors recited in that claim are related to the MOS type transistor defined in the parent claims from which claim 4 depends.

Claim 4 has been amended to recite that the originally claimed “first” transistor is the MOS type transistor defined in the claims from which claim 4 depends. The second and third “transistors” defined in claim 4 are in addition to the MOS type transistor defined in claims 2 and 3 and their functions and interrelationship have been defined more clearly in amended claim 4. Thus it is believed that the objection to claim 4 has also been overcome.

Claim Rejections Under 35 U.S.C. § 103

Paragraph 6 of the Office Action rejects claims 1-3 under 35 U.S.C. 103(a) as being unpatentably obvious over Yonemoto U.S. Patent No. 5,808,677. Claim 1 has been

cancelled. Claims 2 and 3 have been amended in view of the objections to the drawings and disclosure discussed above that evidence the Examiner's confusion between the claimed "image sensor" and the plurality of "light sensor circuits" forming the image sensor. Specifically, claims 2 and 3 have been amended to recite that "each of said MOS type sensors for each of said pixels" is included in each "light sensor circuit", which amendments are for clarity rather than for distinguishing over any prior art. Also, the term "parasitic capacity" in each of those claims has been amended to read "parasitic capacitor" to more correctly identify the device that accumulates the electrical charge rather than the function.

Although the Office Action correctly points out that Yonemoto discloses a device that is capable of removing an electric charge (see col. 7, ll. 27-38), that device is entirely different than Applicants' claimed invention. Each light sensor circuit, a multiplicity of which comprise the "image sensor", according to the present invention is provided with a means for removing an electric charge that is accumulated in the parasitic capacitor C of the photoelectric converting element by switching the drain voltage of the MOS type transistor (which is for converting a sensor current flowing in a photoelectric converting element to a voltage signal) to a lower-than-normal level for a specified period of time, as specifically required by independent claims 2 and 3.

On the other hand, the imaging device disclosed in Yonemoto has a load capacitor element 14 whose electric charge must be removed. A load capacitor 14 is provided for each vertical signal line 5 and it is different than the parasitic capacitor C of each of the plurality of light sensor circuits of the image sensor defined by claims 2 and 3. The

parasitic capacitor C defined in claims 2 and 3 is provided with each photoelectric converting element of each light sensor circuit for producing a unit pixel of the image sensor. In contrast, the load capacitor 14 of the Yonemoto device is connected to all of the light sensor circuits in a single vertical line which is more similar, for example, to a sample-and-hold circuit (SH1-SH4) shown in Fig. 11 of the image sensor system of the present invention. Thus, claims 2 and 3 clearly distinguish over Yonemoto in providing a parasitic capacitor in each light sensor circuit.

Furthermore, the electric charge accumulated in each parasitic capacitor C of each light sensor circuit (D11-D14, D21-D24, D31-D34 and D41-D44) of the present invention of claims 2 and 3 is removed by changing the drain voltage of each MOS type transistor to a value lower than a normal value for a specified period of time. On the contrary, Yonemoto does not describe nor disclose the control of the voltage Vdd connected to a drain of a plurality of pixel MOS type transistors 1 (see col. 4, l. 37). In the Yonemoto device, an electric charge is removed from the load capacitor 14 by using a reset MOS switch 31 provided separately from the plurality of pixel MOS type transistors. Thus, claims 2 and 3 clearly distinguish over Yonemoto in still another manner. Thus, it is respectfully submitted that claims 2 and 3 are not unpatentably obvious over Yonemoto and therefore are allowable.

Claims 4 and 5 depend from claims 2 and 3 and add further limitations, whereby it is respectfully submitted that claims 4 and 5 are allowable for the same reasons as claims 2 and 3 are allowable. The secondary reference, Hoffman, applied in the rejection of claims

4 and 5 does not disclose the above-described features required by claims 2 and 3 that distinguish over Yonemoto and therefore Hoffman does not change the allowability of claims 4 and 5.

Summary

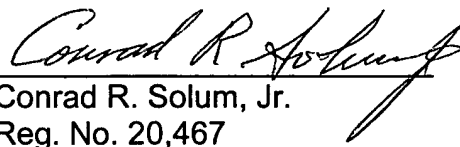
It is believed that the foregoing explanation adequately overcomes the objections to the drawings and specification with respect to the erroneous assumptions in the Office Action that the terms "image sensor" and "light sensor circuit" are the same, whereby those objections should be withdrawn. It is believed that the new title is adequately descriptive of the invention. The objections to claims 3 and 4 based on informalities have been corrected by appropriate amendments to those claims. Lastly, the rejections of original claims 1-5 based on the prior art have been overcome by the foregoing remarks identifying the elements and functions defined by claims 2 and 3 that clearly distinguish over the cited references, whereby the claim rejections should be withdrawn. Thus, a favorable action on the merits and an allowance of now-pending claims 2-5 is respectfully solicited.

Respectfully submitted,

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Date: April 27, 2005

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